DRINKING WATER SURVEILLANCE PROGRAM

DRESDEN WATER TREATMENT PLANT

ANNUAL REPORT 1990

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DRESDEN
WATER TREATMENT PLANT

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

DRESDEN WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Dresden water treatment plant is a conventional treatment plant which treats water from the Sydenham River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, taste and odour control and disinfection. Powdered activated carbon, applied for taste and odour control and pesticide reduction, was discontinued in the fall of 1990. This plant has a rated capacity of 2.3 x 1000 m^3/day. The Dresden water treatment plant serves a population of approximately 2,500.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

The Ontario Drinking Water Objective (ODWO) of 1.0 Formazin Turbidity Units for turbidity was exceeded in the treated water sample in January. This result was confirmed by the field turbidity. The District Officer was notified.

The Dresden water treatment plant, for the sample year of 1990, produced adequate quality water and this was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	21	20	95	6	0	0	6	1	16	5	3	60
CHEMISTRY (FLD)	21	18	85	35	35	100	65	64	98	54	49	90
CHEMISTRY (LAB)	154	143	92	154	120	77	228	206	90	190	179	94
METALS	167	91	54	168	68	40	276	131	47	230	125	54
CHLOROAROMATICS	84	0	0	84	0	0	84	0	0	70	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	99	0	0	116	0	0	17	0	0	17	0	0
PESTICIDES & PCB	205	4	1	218	4	1	128	0	0	107	0	0
PHENOLICS	7	4	57	7	3	42	.	.	.	.	.	.
SPECIFIC PESTICIDES	57	0	0	57	0	0	6	0	0	5	0	0
VOLATILES	203	1	0	203	27	13	145	19	13	116	16	13
TOTAL	1030	281		1060	257		955	421		794	372	

DRINKING WATER SURVEILLANCE PROGRAM

DRESDEN WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Dresden water treatment plant in the spring of 1985 as part of the alachlor pesticide study conducted in the Southwestern Region. Previous annual reports have been published for 1986, 1987, 1988 and 1989.

PLANT DESCRIPTION

The Dresden water treatment plant is a conventional treatment plant which treats water from the Sydenham River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration, taste and odour control and disinfection. Powdered activated carbon, applied for taste and odour control and pesticide reduction, was discontinued in the fall of 1990. This plant has a rated capacity of 2.3 x 1000 m^3/day. The Dresden water treatment plant serves a population of approximately 2,500.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing

samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher

temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 7 of 15 treated and distributed water samples with a maximum reported value of 22.0°C.

CHEMISTRY (LAB)

Calcium exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 100 mg/L in 11 of 18 treated and distributed water samples with a maximum reported value of 117.9 mg/L.

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 HZU in 5 of 18 treated and distributed water samples with a maximum reported value of 9.5 HZU.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the EEC Aesthetic Guideline Level of 400 umho/cm in 18 of 18 treated and distributed water samples with a maximum reported value of 841.0 umho/cm.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 18 of 18 treated and distributed water samples with a maximum reported value of 385.0 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWOs Maximum Acceptable Concentration for turbidity is 1 Formazin Turbidity Unit (FTU).

Protocol for turbidity analysis states that laboratory and field measurements should be made within 48 hours of obtaining the sample. Since laboratory turbidity analysis is not always conducted within 48 hours, the field turbidity values are considered more reliable.

The laboratory turbidity exceeded the Maximum Acceptable Concentration in 2 of 7 treated water samples in January at 4.2 FTU and August at 11.4 FTU. The field turbidity of 2.9 FTU confirmed the exceedance in January and the District Officer was notified.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 3 of 18 treated and distributed water samples with a maximum reported value of 510.0 ug/L.

Manganese, in high concentrations, can contribute to laundry staining and undesirable tastes.

Manganese exceeded the ODWO Maximum Desirable Concentration of 50 ug/L in 1 of 18 treated and distributed water samples with a maximum reported value of 64.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatics scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenols scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

Atrazine was found at positive levels in 4 of the 7 treated water samples analyzed. The maximum observed level was 1,910.0 ng/L. This was below the ODWO Interim Maximum Acceptable Concentration of 60,000 ng/L.

Other pesticides including des-ethyl atrazine, cyanazine and metolachlor, were detected at trace levels. There was no noticeable reduction in pesticide concentrations from the raw water to the treated water, as would be expected if sufficient powdered activated carbon was added during treatment. Carbon addition was discontinued in the fall of 1990.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water.

Phenolics exceeded the ODWO Aesthetic or Recommended Operational Guideline of 2 ug/L in 1 of 7 treated water samples with a maximum reported value of 3.6 ug/L.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 16 treated and distributed water samples analyzed with a maximum reported value of 105.8 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

Health related ODWO guidelines were exceeded in 1990 for one parameter. Turbidity values were above the guideline in one treated water sample.

As noted in previous DWSP annual reports for the Dresden water supply, the raw water source is adversely affected by agricultural use of the watershed.

The Dresden water treatment plant, for the sample year of 1990, produced adequate quality water and this was maintained in the distribution system.

FIGURE 1

DRESDEN WATER TREATMENT PLANT

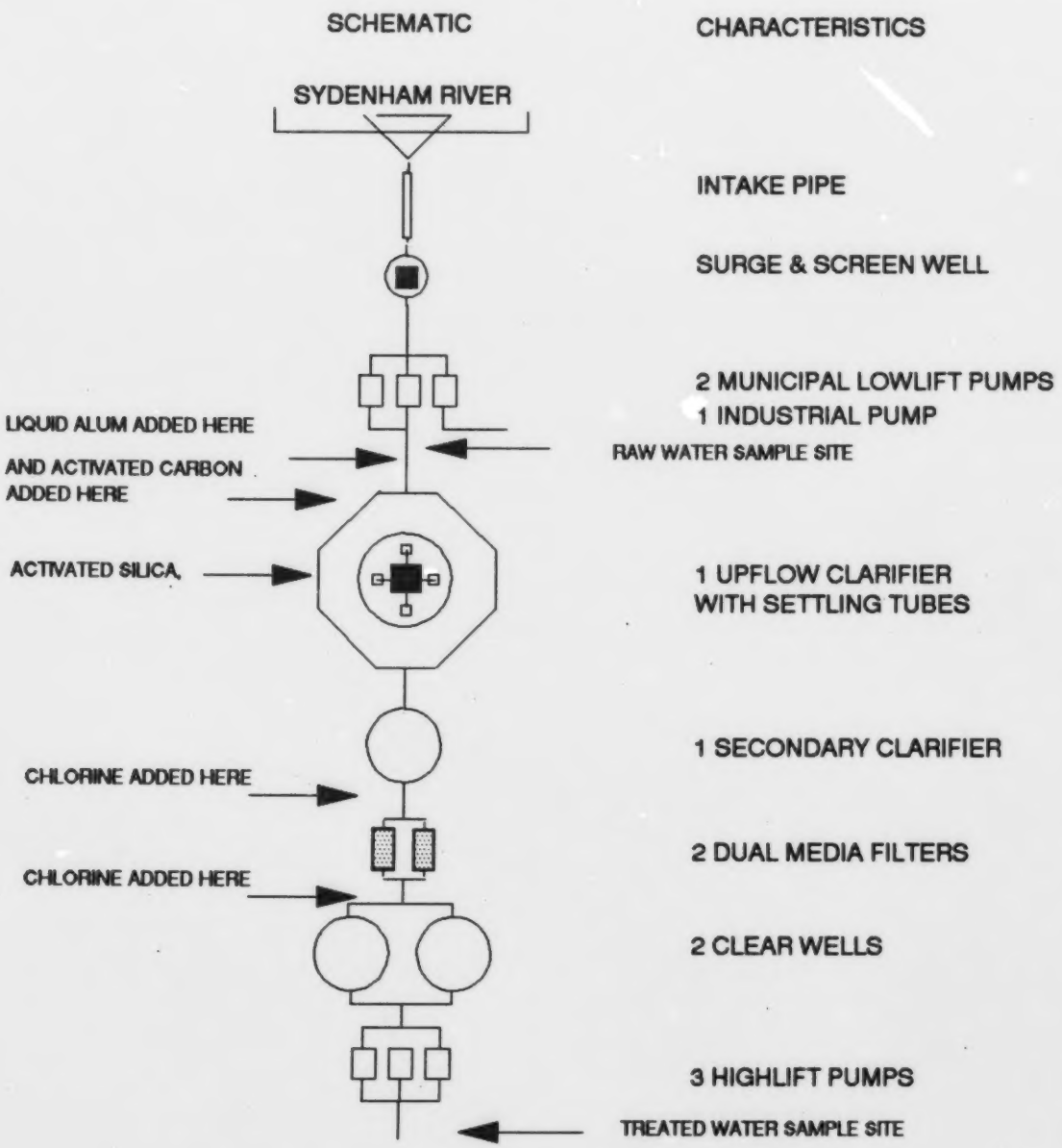

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 210000283
PLANT NAME: DRESDEN WTP

DISTRICT: LONDON
REGION: SOUTHWEST
DISTRICT OFFICER :O. WIGLE

UTM #: 174038604715670

PLANT SUPERINTENDENT: CHUCK SHERMAN

ADDRESS: 749 PEEL ST., P.O.BOX 1120
DRESDEN, ONTARIO
NOP 1M0
(519 683 6103)

MUNICIPALITY: DRESDEN
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	.581	(X 1000 M3)
DESIGN CAPACITY:	3.819	(X 1000 M3/DAY)
RATED CAPACITY:	2.374	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
CANADIAN CANNERS	0
DRESDEN	2,477

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
COMBINED CHLORINE RESIDUAL	AFTER FILTERS	4 READINGS PER DAY
FREE CHLORINE RESIDUAL	TREATED WATER	4 READINGS PER DAY
TEMPERATURE	RAW WATER	DAILY READING
TURBIDITY	RAW WATER IN LAB	DAILY READING
	RAW WATER	DAILY READING
	TREATED WATER	3 READINGS PER DAY

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGES (MG/L)	
			COAGULATION AID	POST CHLORINATION
			SODIUM SILICATE	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)		
EC 11	-	-	10.34	3.18

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

NO OTHER DOSAGES WERE REPORTED)

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	7	7	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	6	0	0	6	1	0	5	3	0
TOTAL COLIFORM MF	7	6	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	7	7	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	21	20	0	6	0	0	6	1	0	5	3	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	1	0	0	6	6	0	12	12	0	9	7	0
FLD CHLORINE FREE	1	0	0	6	6	0	12	11	0	10	7	0
FLD CHLORINE (TOTAL)	1	0	0	6	6	0	12	12	0	10	10	0
FLD PH	6	6	0	5	5	0	12	12	0	10	10	0
FLD TEMPERATURE	6	6	0	6	6	0	10	10	0	8	8	0
FLD TURBIDITY	6	6	0	6	6	0	7	7	0	7	7	0
*TOTAL SCAN CHEMISTRY (FLD)	21	18	0	35	35	0	65	64	0	54	49	0
CHEMISTRY (LAB)												
ALKALINITY	7	7	0	7	7	0	12	12	0	10	10	0
CALCIUM	7	7	0	7	7	0	12	12	0	10	10	0
CYANIDE	7	0	0	7	0	1	.	.	.	.	.	.
CHLORIDE	7	7	0	7	7	0	12	12	0	10	10	0
COLOUR	7	7	0	7	6	1	12	12	0	10	10	0
CONDUCTIVITY	7	7	0	7	7	0	12	12	0	10	10	0
DISS ORG CARBON	7	7	0	7	7	0	12	12	0	10	10	0
FLUORIDE	7	7	0	7	7	0	12	12	0	10	10	0
HARDNESS	7	7	0	7	7	0	12	12	0	10	10	0
IONCAL	7	7	0	7	7	0	12	12	0	10	10	0
LANGELIERS INDEX	7	7	0	7	7	0	12	12	0	10	10	0
MAGNESIUM	7	7	0	7	7	0	12	12	0	10	10	0
SODIUM	7	7	0	7	7	0	12	12	0	10	10	0
AMMONIUM TOTAL	7	3	1	7	1	2	12	4	3	10	8	2
NITRITE	7	7	0	7	0	7	12	0	11	10	1	9
TOTAL NITRATES	7	7	0	7	7	0	12	12	0	10	10	0
NITROGEN TOT KJELD	7	7	0	7	7	0	12	12	0	10	10	0
PH	7	7	0	7	7	0	12	12	0	10	10	0
PHOSPHORUS FIL REACT	7	7	0	7	2	5	.	.	.	.	.	.
PHOSPHORUS TOTAL	7	7	0	7	1	5	.	.	.	.	.	.
SULPHATE	7	7	0	7	7	0	12	12	0	10	10	0
TURBIDITY	7	7	0	7	5	2	12	10	2	10	10	0
*TOTAL SCAN CHEMISTRY (LAB)	154	143	1	154	120	23	228	206	16	190	179	11

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	7	0	0	7	0	0	12	0	1	10	0	0
ALUMINUM	7	7	0	7	7	0	12	12	0	10	10	0
ARSENIC	7	3	4	7	0	7	12	0	11	10	0	10
BARIUM	7	7	0	7	7	0	12	12	0	10	10	0
BORON	7	6	1	7	6	1	12	10	2	10	9	1
BERYLLIUM	7	0	4	7	0	2	12	0	2	10	0	1
CADMIUM	7	0	3	7	0	2	12	0	7	10	0	3
COBALT	7	0	6	7	0	5	12	0	6	10	0	6
CHROMIUM	7	2	4	7	0	4	12	1	6	10	0	7
COPPER	7	6	1	7	1	6	12	6	6	10	10	0
IRON	7	7	0	7	0	3	12	0	6	10	8	2
MERCURY	6	0	3	7	0	2	.	.	.	.	.	.
MANGANESE	7	7	0	7	7	0	12	12	0	10	10	0
MOLYBDENUM	7	6	1	7	7	0	12	12	0	10	10	0
NICKEL	7	0	1	7	0	1	12	1	2	10	0	3
LEAD	7	5	2	7	1	6	12	6	6	10	9	1
ANTIMONY	7	0	7	7	0	7	12	3	9	10	3	7
SELENIUM	7	0	6	7	0	4	12	0	11	10	0	9
STRONTIUM	7	7	0	7	7	0	12	12	0	10	10	0
TITANIUM	7	7	0	7	7	0	12	12	0	10	10	0
THALLIUM	7	0	0	7	0	0	12	0	0	10	0	0
URANIUM	7	7	0	7	5	2	12	8	4	10	7	3
VANADIUM	7	7	0	7	6	1	12	12	0	10	9	1
ZINC	7	7	0	7	7	0	12	12	0	10	10	0
*TOTAL SCAN METALS	167	91	43	168	68	53	276	131	79	230	125	54
*TOTAL GROUP INORGANIC & PHYSICAL	342	252	44	357	223	76	569	401	95	474	353	65
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	6	0	0	6	0	0	6	0	0	5	0	0
123 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1234 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1235 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
124 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1245 T-CHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
135 TRICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
HCB	6	0	0	6	0	0	6	0	0	5	0	0
HEXACHLOROETHANE	6	0	0	6	0	1	6	0	1	5	0	0
OCTACHLOROSTYRENE	6	0	0	6	0	0	6	0	0	5	0	0
PENTACHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
236 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0	5	0	0
245 TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0	5	0	0
26A TRICHLOROTOLUENE	6	0	0	6	0	0	6	0	0	5	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	84	0	1	84	0	1	70	0	0
CHLOROPHENOLS												

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	0	0	0	0	0	0
PAH												
PHENANTHRENE	6	0	1	7	0	0	1	0	0	1	0	0
ANTHRACENE	5	0	0	6	0	0	1	0	0	1	0	0
FLUORANTHENE	6	0	0	7	0	0	1	0	0	1	0	0
PYRENE	6	0	0	7	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	6	0	0	7	0	0	1	0	0	1	0	0
CHRYSENE	6	0	0	7	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	5	0	0	6	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	6	0	0	7	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	6	0	0	7	0	0	1	0	0	1	0	0
PERYLENE	6	0	0	7	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	6	0	0	7	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	5	0	0	6	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	6	0	0	7	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	6	0	0	7	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	6	0	0	7	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	6	0	0	7	0	0	1	0	0	1	0	0
CORONENE	6	0	0	7	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	99	0	1	116	0	0	17	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	6	0	0	6	0	0	6	0	0	5	0	0
ALPHA BHC	6	0	0	6	0	0	6	0	0	5	0	0
BETA BHC	6	0	0	6	0	0	6	0	0	5	0	0
LINDANE	6	0	0	6	0	1	6	0	1	5	0	0
ALPHA CHLORDANE	6	0	0	6	0	0	6	0	0	5	0	0
GAMMA CHLORDANE	6	0	0	6	0	0	6	0	0	5	0	0
DIELDRIN	6	0	0	6	0	0	6	0	0	5	0	0
METHOXYCHLOR	6	0	0	6	0	0	6	0	0	5	0	0
ENDOSULFAN 1	6	0	0	6	0	0	6	0	0	5	0	0
ENDOSULFAN II	6	0	0	6	0	0	6	0	0	5	0	0
ENDRIN	6	0	0	6	0	0	6	0	0	5	0	0
ENDOSULFAN SULPHATE	6	0	0	6	0	0	6	0	0	5	0	0
HEPTACHLOR EPOXIDE	6	0	0	6	0	0	6	0	0	5	0	0
HEPTACHLOR	6	0	0	6	0	0	6	0	0	5	0	0
MIREX	6	0	0	6	0	0	6	0	0	5	0	0
OXYCHLORDANE	6	0	0	6	0	0	6	0	0	5	0	0
OPDDT	6	0	0	6	0	0	6	0	0	5	0	0
PCB	6	0	0	6	0	0	6	0	0	5	0	0
DDD	6	0	0	6	0	0	6	0	0	5	0	0
PPDDE	6	0	0	6	0	0	6	0	0	5	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	6	0	0	6	0	0	5	0	0
AMETRINE	6	0	0	7	0	0	.	.	.	.	.	.
ATRAZINE	6	4	1	7	4	1	.	.	.	.	.	.
ATRATONE	6	0	0	7	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	6	0	1	7	0	1	.	.	.	.	.	.
DESETHYLATRAZINE	6	0	2	7	0	2	.	.	.	.	.	.
D-ETHYL SIMAZINE	6	0	0	7	0	0	.	.	.	.	.	.
PROMETONE	6	0	0	7	0	0	.	.	.	.	.	.
PROPAZINE	6	0	0	7	0	0	.	.	.	.	.	.
PROMETRYNE	6	0	0	7	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	6	0	0	7	0	0	.	.	.	.	.	.
SIMAZINE	6	0	0	7	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	6	0	0	7	0	0	.	.	.	.	.	.
METOLACHLOR	6	0	1	7	0	1	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	1	0	0	2	0	0	2	0	0
*TOTAL SCAN PESTICIDES & PCB	205	4	5	218	4	6	128	0	1	107	0	0
PHENOLICS												
PHENOLICS	7	4	0	7	3	2	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	7	4	0	7	3	2	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	6	0	0	6	0	0	6	0	0	5	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	2	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	2	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	.	.	.	.	.	.
ETHION	2	0	0	2	0	0	.	.	.	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	2	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	2	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	2	0	0	2	0	0	.	.	.	.	.	.
PARATHION	2	0	0	2	0	0	.	.	.	.	.	.
PHORATE	1	0	0	1	0	0	.	.	.	.	.	.
RELDAN	2	0	0	2	0	0	.	.	.	.	.	.
RONNEL	2	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	57	0	0	57	0	0	6	0	0	5	0	0
VOLATILES												
BENZENE	7	0	0	7	0	1	5	0	0	4	0	0
TOLUENE	7	0	0	7	0	3	5	0	1	4	0	1
ETHYLBENZENE	7	0	2	7	0	3	5	0	1	4	0	3
P-XYLENE	7	0	0	7	0	0	5	0	0	4	0	0
M-XYLENE	7	0	0	7	0	1	5	0	1	4	0	1
O-XYLENE	7	0	0	7	0	2	5	0	1	4	0	1
STYRENE	7	0	3	7	0	3	5	0	3	4	0	2
1,1 DICHLOROETHYLENE	7	0	0	7	0	0	5	0	0	4	0	0
METHYLENE CHLORIDE	7	0	0	7	0	0	5	0	0	4	0	0
T1,2DICHLOROETHYLENE	7	0	0	7	0	0	5	0	0	4	0	0
1,1 DICHLOROETHANE	7	0	0	7	0	0	5	0	0	4	0	0
CHLOROFORM	7	0	1	7	7	0	5	5	0	4	4	0
111, TRICHLOROETHANE	7	1	0	7	0	0	5	0	0	4	0	0
1,2 DICHLOROETHANE	7	0	0	7	0	0	5	0	0	4	0	0
CARBON TETRACHLORIDE	7	0	0	7	0	0	5	0	0	4	0	0
1,2 DICHLOROPROPANE	7	0	0	7	0	0	5	0	0	4	0	0
TRICHLOROETHYLENE	7	0	0	7	0	0	5	0	0	4	0	0
DICHLOROBROMOMETHANE	7	0	0	7	7	0	5	5	0	4	4	0
112 TRICHLOROETHANE	7	0	0	7	0	0	5	0	0	4	0	0
CHLORODIBROMOMETHANE	7	0	0	7	6	1	5	4	1	4	4	0
T-CHLOROETHYLENE	7	0	0	7	0	0	5	0	0	4	0	0
BROMOFORM	7	0	0	7	0	3	5	0	2	4	0	1
1122 T-CHLOROETHANE	7	0	0	7	0	0	5	0	0	4	0	0
CHLOROBENZENE	7	0	0	7	0	0	5	0	0	4	0	0
1,4 DICHLOROBENZENE	7	0	0	7	0	0	5	0	0	4	0	0
1,3 DICHLOROBENZENE	7	0	0	7	0	0	5	0	0	4	0	0
1,2 DICHLOROBENZENE	7	0	0	7	0	0	5	0	0	4	0	0
ETHLYENE DIBROMIDE	7	0	0	7	0	0	5	0	0	4	0	0
TOTL TRIHALOMETHANES	7	0	0	7	7	0	5	5	0	4	4	0
*TOTAL SCAN VOLATILES	203	1	6	203	27	17	145	19	10	116	16	9
*TOTAL GROUP ORGANIC	667	9	12	697	34	26	380	19	12	315	16	9

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 0 (A1)	
JAN	124	.	.	.	.	.
FEB	148	.	.	.	.	.
APR	46	.	.	.	.	.
JUN	240	.	.	.	.	.
AUG	42	.	.	.	.	.
OCT	172	.	.	.	.	.
DEC	132	.	.	.	.	.
STANDRD PLATE CNT MF (COUNTS/LS)			DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)	
JAN	.	1 <=>	.	.	.	.
FEB	.	.	.	14	.	4 <=>
APR	.	1 <=>	.	0 <=>	.	3 <=>
JUN	.	1 <=>	.	0 <=>	.	.
AUG	.	3 <=>	.	0 <=>	.	34
OCT	.	1 <=>	.	7 <=>	.	203
DEC	.	1 <=>	.	5 <=>	.	14
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)	
JAN	7400	.	.	.	.	.
FEB	6900	.	.	.	.	.
APR	2400	.	.	.	.	.
JUN	1500	.	.	.	.	.
AUG	200 <=>	.	.	.	.	.
OCT	1280	.	.	.	.	.
DEC	15000	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = N/A	
JAN	73000	.	.	.	.	.
FEB	90000	.	.	.	.	.
APR	9800	.	.	.	.	.
JUN	68000	.	.	.	.	.
AUG	51000	.	.	.	.	.
OCT	34000	.	.	.	.	.
DEC	10000	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.200	.	.	.	.
FEB	.	.200	.200	.200	.000	.200
APR	.	.200	.200	.400	.100	.200
JUN	.	.100	.100	.200	.	.
AUG	.	.400	.050	.200	.100	.000
OCT	.	.200	.100	.350	.100	.100
DEC	.	.	.050	.230	.	.230
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	1.900	.	.	.	.
FEB	.	.800	.100	.100	.100	.100
APR	.	.800	.100	.300	.100	.100
JUN	.	1.000	.100	.100	.	.
AUG	.	.500	.100	.200	.000	.100
OCT	.	1.300	.100	.150	.100	.000
DEC	.	.	.000	.070	.000	.070
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	2.100	.	.	.	.
FEB	.	1.000	.300	.300	.100	.300
APR	.	1.000	.300	.700	.200	.300
JUN	.	1.100	.200	.300	.	.
AUG	.	.900	.150	.400	.100	.100
OCT	.	1.500	.200	.500	.200	.100
DEC	.	.	.050	.300	.050	.300
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	7.500	7.700	.	.	.	.
FEB	7.500	6.900	7.000	6.800	6.900	6.900
APR	7.800	.	7.000	6.800	6.700	6.900
JUN	7.900	7.100	7.200	7.000	.	.
AUG	7.900	7.000	6.900	6.900	6.900	6.900
OCT	8.200	7.000	7.200	7.200	7.000	7.200
DEC	.	.	7.400	7.300	7.400	7.400
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)		
JAN	2.000	3.000	.	.	.	.
FEB	3.000	4.000	.	.	5.000	4.000
APR	10.000	9.000	9.000	2.000	10.000	7.000
JUN	20.000	20.000	20.000	17.000	.	.
AUG	23.000	22.000	22.000	22.000	.	.
OCT	16.500	16.500	19.000	17.000	19.000	17.000
DEC	.	.	22.000	8.000	22.000	9.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)		
JAN	10.000	2.900	.	.	.	.
FEB	127.000	.770	.	.500	.	.540
APR	45.000	.240	.	.	.	.
JUN	103.000	.140	.430	.140	.	.
AUG	37.000	.230	.330	.360	2.800	.830
OCT	57.000	.150	.230	.220	1.310	.640
DEC	.	.	.	.	.820	.140

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 30-500 (A4)	
JAN	252.300	257.300	.	.	.	.
FEB	124.100	89.400	91.700	87.600	93.300	98.000
APR	198.700	162.400	156.500	154.500	157.900	155.000
JUN	208.100	167.000	171.700	173.400	.	.
AUG	193.600	146.500	146.400	145.200	148.800	148.300
OCT	249.400	191.000	215.600	214.500	216.200	212.700
DEC	241.400	232.100	203.700	204.200	213.200	205.700
CALCIUM (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 100 (F2)	
JAN	112.900	117.900	.	.	.	.
FEB	64.200	64.600	63.000	63.400	62.600	67.200
APR	104.000	102.000	104.000	104.000	105.000	105.000
JUN	101.000	100.000	104.000	105.000	.	.
AUG	85.600	84.000	83.000	84.300	85.400	84.800
OCT	113.000	110.000	108.000	108.000	108.000	107.000
DEC	120.400	110.900	105.000	108.000	110.000	108.000
CYANIDE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = .2 (A1)	
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	BDL	.004 <T	.	.	.	.
CHLORIDE (MG/L)			DET'N LIMIT = 0.2		GUIDELINE = 250 (A3)	
JAN	39.700	43.500	.	.	.	.
FEB	20.600	21.900	21.200	22.800	22.300	23.600
APR	32.100	33.900	33.200	33.200	33.600	33.500
JUN	33.700	35.300	36.400	35.200	.	.
AUG	26.800	28.800	29.600	29.500	29.400	29.400
OCT	34.000	38.600	36.700	37.500	36.500	36.400
DEC	30.700	32.500	32.100	31.600	31.900	31.800
COLOUR (HZU)			DET'N LIMIT = 0.5		GUIDELINE = 5 (A3)	
JAN	9.500	1.500 <T	.	.	.	.
FEB	31.000	3.500	4.500	4.000	3.500	4.500
APR	14.000	3.000	3.500	2.500	4.000	4.000
JUN	11.000	3.000	4.000	3.000	.	.
AUG	15.500	3.000	3.500	3.000	5.500	4.500
OCT	24.000	4.500	7.500	6.500	9.500	7.500
DEC	15.500	7.000	9.000	7.000	10.000	9.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.		GUIDELINE = 400 (F2)	
JAN	756	841	.	.	.	.
FEB	449	497	473	488	481	505
APR	656	695	699	698	695	696
JUN	665	708	715	713	.	.
AUG	559	595	589	586	590	593
OCT	696	745	726	730	725	731
DEC	691	712	693	692	701	689

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)		
JAN	3.200	3.000	.	.	.	.
FEB	5.700	2.400	2.300	2.200	2.500	2.400
APR	5.400	3.200	3.200	3.100	3.400	3.100
JUN	4.800	2.800	3.000	2.900	.	.
AUG	5.000	3.100	2.800	2.700	2.800	2.700
OCT	6.100	4.000	4.500	4.700	4.200	4.400
DEC	4.800	4.200	4.300	4.100	3.900	3.900
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)		
JAN	.120	.100	.	.	.	.
FEB	.140	.080	.080	.060	.060	.040
APR	.140	.060	.060	.060	.060	.060
JUN	.120	.080	.060	.060	.	.
AUG	.180	.120	.100	.100	.100	.100
OCT	.140	.060	.100	.120	.080	.080
DEC	.120	.120	.120	.100	.100	.120
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)		
JAN	366.200	385.000	.	.	.	.
FEB	203.000	202.000	196.400	200.000	196.000	211.000
APR	331.000	325.000	331.000	334.000	334.000	333.000
JUN	326.000	325.000	336.000	337.000	.	.
AUG	278.600	273.400	270.700	275.000	276.800	275.500
OCT	358.000	353.000	346.000	348.000	346.000	347.000
DEC	379.300	353.600	333.000	340.000	347.000	340.000
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	.249	4.028	.	.	.	.
FEB	4.285	4.223	4.526	5.105	5.489	3.046
APR	2.461	1.132	2.095	3.253	2.325	3.419
JUN	.985	2.416	.461	.785	.	.
AUG	1.909	.029	.378	2.439	1.602	1.170
OCT	2.022	.703	.209	.221	.227	.763
DEC	5.778	5.809	.742	1.637	1.241	1.022
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	1.256	1.129	.	.	.	.
FEB	.645	.321	.413	.415	.367	.237
APR	1.241	.833	.655	.610	1.124	.685
JUN	1.198	.806	.865	.833	.	.
AUG	1.223	.890	.935	.869	1.004	.920
OCT	1.354	.824	.820	.767	.881	.799
DEC	1.438	1.334	1.094	1.088	1.174	1.141
MAGNESIUM (MG/L)			DET'N LIMIT = 0.1	GUIDELINE = 30 (F2)		
JAN	20.500	22.000	.	.	.	.
FEB	10.400	9.900	9.500	10.000	9.700	10.600
APR	17.500	17.100	17.400	17.900	17.500	17.400
JUN	17.900	18.200	18.200	18.600	.	.
AUG	15.750	15.450	15.400	15.650	15.450	15.500
OCT	18.800	19.200	18.400	18.800	18.700	19.100
DEC	19.150	18.650	17.200	17.300	17.500	17.400

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
JAN	19.000	26.100	.	.	.	.
FEB	6.000	13.400	12.400	12.800	12.600	12.800
APR	10.600	16.200	15.800	16.800	16.400	16.400
JUN	11.600	16.400	16.800	16.400	.	.
AUG	11.700	15.700	16.100	16.000	16.100	16.000
OCT	12.200	16.200	16.600	17.200	16.600	17.000
DEC	9.500	13.600	14.200	14.200	13.800	14.000
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
JAN	.114	BDL	.	.	.	.
FEB	.020	BDL	.002 <T	BDL	.010	.006 <T
APR	BDL	BDL	BDL	BDL	.010	.002 <T
JUN	BDL	BDL	BDL	BDL	.	.
AUG	.034	.010	.014	.008 <T	.012	.016
OCT	.008 <T	.008 <T	.020	.008 <T	.014	.018
DEC	BDL	.006 <T	.012	.012	.014	.018
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
JAN	.042	.002 <T	.	.	.	.
FEB	.072	.002 <T	.002 <T	.001 <T	.003 <T	.003 <T
APR	.029	.001 <T	.001 <T	.001 <T	.002 <T	.001 <T
JUN	.052	.003 <T	.003 <T	.003 <T	.	.
AUG	.025	.002 <T	.002 <T	.002 <T	.007	.004 <T
OCT	.026	.001 <T	.002 <T	.001 <T	.003 <T	.002 <T
DEC	.023	.001 <T	BDL	.001 <T	.001 <T	.002 <T
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
JAN	5.080	5.820	.	.	.	.
FEB	8.790	8.250	8.050	8.450	8.000	7.750
APR	9.100	8.950	8.650	8.850	8.800	8.850
JUN	9.650	9.280	9.450	9.800	.	.
AUG	3.680	3.900	3.190	3.220	3.550	3.820
OCT	6.200	6.230	6.100	6.030	6.150	6.230
DEC	8.400	1.700	7.920	7.700	7.850	8.580
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.610	.340	.	.	.	.
FEB	1.010	.400	.400	.370	.430	.390
APR	.770	.580	.330	.470	.380	.200
JUN	.780	.400	.420	.390	.	.
AUG	.975	.700	.440	.440	.490	.440
OCT	1.050	.490	.210	.800	.360	.700
DEC	.690	.500	.520	.470	.420	.480
PH (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	8.280	8.130	.	.	.	.
FEB	8.200	8.020	8.110	8.130	8.060	7.880
APR	8.400	8.090	7.920	7.880	8.380	7.950
JUN	8.350	8.060	8.090	8.050	.	.
AUG	8.470	8.270	8.320	8.250	8.370	8.290
OCT	8.380	7.980	7.930	7.880	7.990	7.920
DEC	8.450	8.400	8.240	8.220	8.280	8.270

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHOSPHORUS FIL REACT (MG/L)		DET'N LIMIT = 0.005		GUIDELINE = N/A		
JAN	.013	.001 <T	.	.	.	.
FEB	.075	.000 <T	.	.	.	.
APR	.012	.001 <T	.	.	.	.
JUN	.027	.000 <T	.	.	.	.
AUG	.018	.003	.	.	.	.
OCT	.038	.003	.	.	.	.
DEC	.029	.002 <T	.	.	.	.
PHOSPHORUS TOTAL (MG/L)		DET'N LIMIT = 0.002		GUIDELINE = .40 (F2)		
JAN	.034	.005 <T	.	.	.	.
FEB	.170	.005 <T	.	.	.	.
APR	.061	.006 <T	.	.	.	.
JUN	.109	.002 <T	.	.	.	.
AUG	.040	.037	.	.	.	.
OCT	.100	.004 <T	.	.	.	.
DEC	.060	BDL	.	.	.	.
SULPHATE (MG/L)		DET'N LIMIT = .200		GUIDELINE = 500 (A3)		
JAN	79.230	115.230	.	.	.	.
FEB	39.240	87.510	79.760	85.350	79.270	84.070
APR	66.870	109.480	118.950	120.270	119.690	118.430
JUN	61.790	114.240	111.360	114.480	.	.
AUG	51.620	102.220	100.720	99.820	99.770	99.180
OCT	56.500	119.000	89.480	90.910	90.230	95.460
DEC	60.900	75.000	85.700	85.900	82.400	83.300
TURBIDITY (FTU)		DET'N LIMIT = 0.05		GUIDELINE = 1 (A1)		
JAN	6.100	4.200	.	.	.	.
FEB	89.000	.610	.950	.600	.700	.500
APR	31.000	.290	.370	.190 <T	.730	.640
JUN	55.000	.200 <T	.650	.250 <T	.	.
AUG	39.000	11.400	.500	.430	1.850	1.150
OCT	58.000	.210 <T	.370	.430	1.500	.700
DEC	.250	.460	.800	.650	1.470	1.090

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
SILVER (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A1)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	.090 <T	BDL	BDL
JUN	BDL	BDL	BDL	BDL	.	.
AUG	BDL	BDL	BDL	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
JAN	120.000	380.000	.	.	.	.
FEB	790.000	190.000	160.000	63.000	110.000	48.000
APR	330.000	55.000	34.000	13.000	19.000	33.000
JUN	410.000	28.000	63.000	26.000	.	.
AUG	270.000	510.000	47.000	49.000	76.000	79.000
OCT	460.000	21.000	51.000	19.000	18.000	17.000
DEC	290.000	44.000	100.000	20.000	28.000	33.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
JAN	.550 <T	.450 <T	.	.	.	.
FEB	.680 <T	.170 <T	.240 <T	.250 <T	.360 <T	.230 <T
APR	.790 <T	.430 <T	.570 <T	.440 <T	.340 <T	.520 <T
JUN	1.300	.560 <T	.600 <T	.450 <T	.	.
AUG	1.300	.270 <T	BDL	.280 <T	.280 <T	.210 <T
OCT	1.400	.370 <T	.540 <T	.390 <T	.420 <T	.500 <T
DEC	.880 <T	.320 <T	.290 <T	.300 <T	.300 <T	.240 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
JAN	57.000	30.000	.	.	.	.
FEB	36.000	24.000	24.000	25.000	24.000	25.000
APR	39.000	29.000	31.000	29.000	29.000	29.000
JUN	50.000	40.000	41.000	39.000	.	.
AUG	46.000	41.000	41.000	39.000	40.000	40.000
OCT	58.000	47.000	44.000	42.000	43.000	42.000
DEC	45.000	25.000	31.000	26.000	25.000	26.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
JAN	44.000	46.000	.	.	.	.
FEB	20.000 <T	18.000 <T	20.000 <T	18.000 <T	29.000	19.000 <T
APR	36.000	45.000	26.000	55.000	30.000	51.000
JUN	53.000	54.000	52.000	46.000	.	.
AUG	57.000	59.000	56.000	55.000	57.000	54.000
OCT	53.000	47.000	52.000	41.000	49.000	53.000
DEC	60.000	27.000	30.000	40.000	32.000	40.000
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	BDL	BDL	BDL	BDL
APR	.070 <T	.060 <T	BDL	.090 <T	BDL	.070 <T
JUN	.110 <T	BDL	.070 <T	BDL	.	.
AUG	BDL	.060 <T	BDL	BDL	BDL	BDL
OCT	.080 <T	BDL	BDL	BDL	BDL	BDL
DEC	.090 <T	BDL	BDL	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	.	.	.
FEB	.080 <T	BDL	.180 <T	.120 <T	.110 <T	.110 <T
APR	BDL	BDL	BDL	BDL	BDL	BDL
JUN	.070 <T	BDL	.130 <T	BDL	.	.
AUG	BDL	BDL	.060 <T	BDL	BDL	BDL
OCT	BDL	.070 <T	.070 <T	BDL	.060 <T	BDL
DEC	.060 <T	.070 <T	.060 <T	.060 <T	BDL	BDL
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.110 <T	.040 <T	.	.	.	.
FEB	.640 <T	.030 <T	BDL	.170 <T	BDL	BDL
APR	.330 <T	.060 <T	BDL	.130 <T	.120 <T	.060 <T
JUN	.450 <T	BDL	BDL	BDL	.	.
AUG	BDL	BDL	BDL	BDL	BDL	BDL
OCT	.580 <T	.210 <T	.220 <T	.140 <T	.140 <T	.160 <T
DEC	.370 <T	.150 <T	.240 <T	.200 <T	.220 <T	.180 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
JAN	BDL	BDL	.	.	.	.
FEB	.670 <T	BDL	BDL	BDL	BDL	BDL
APR	2.300 <T	3.500 <T	BDL	5.800	BDL	4.400 <T
JUN	4.500 <T	4.300 <T	3.700 <T	2.600 <T	.	.
AUG	4.100 <T	3.700 <T	3.200 <T	3.000 <T	2.800 <T	2.800 <T
OCT	5.600	1.800 <T	4.800 <T	BDL	4.100 <T	4.100 <T
DEC	9.900	BDL	BDL	3.200 <T	1.200 <T	3.100 <T
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)		
JAN	4.400 <T	1.600 <T	.	.	.	.
FEB	53.000	1.800 <T	32.000	2.900 <T	880.000	80.000
APR	30.000	1.800 <T	13.000	3.800 <T	720.000	68.000
JUN	28.000	2.200 <T	38.000	4.000 <T	.	.
AUG	14.000	3.500 <T	42.000	4.500 <T	190.000	57.000
OCT	9.700	3.200 <T	47.000	4.500 <T	610.000	93.000
DEC	14.000	8.000	53.000	3.500 <T	380.000	83.000
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)		
JAN	130.000	BDL	.	.	.	.
FEB	970.000	17.000 <T	20.000 <T	BDL	48.000 <T	35.000 <T
APR	400.000	BDL	BDL	BDL	82.000	69.000
JUN	630.000	BDL	17.000 <T	BDL	.	.
AUG	420.000	27.000 <T	16.000 <T	BDL	360.000	150.000
OCT	600.000	BDL	9.600 <T	BDL	150.000	90.000
DEC	350.000	9.800 <T	34.000 <T	10.000 <T	130.000	150.000
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)		
JAN	.020 <T	.020 <T	.	.	.	.
FEB	.030 <T	.030 <T	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	.080 <T	BDL	.	.	.	.
DEC	ISS	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)		
JAN	20.000	11.000	.	.	.	.
FEB	50.000	64.000	33.000	36.000	38.000	33.000
APR	28.000	31.000	11.000	18.000	21.000	26.000
JUN	62.000	19.000	12.000	8.000	.	.
AUG	41.000	24.000	5.900	2.800	27.000	15.000
OCT	53.000	20.000	12.000	11.000	20.000	16.000
DEC	24.000	11.000	20.000	11.000	16.000	17.000
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	1.000	1.200	.	.	.	.
FEB	.330 <T	1.100	1.200	1.200	1.100	1.200
APR	.650	1.500	1.500	1.500	1.500	1.500
JUN	1.100	2.300	2.300	2.300	.	.
AUG	1.200	2.400	2.300	2.200	2.000	1.900
OCT	.730	1.900	2.100	2.000	2.000	2.000
DEC	.910	2.000	1.600	1.500	1.500	1.500
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	BDL	BDL	BDL	BDL
APR	BDL	BDL	BDL	BDL	.220 <T	BDL
JUN	BDL	BDL	BDL	BDL	.	.
AUG	BDL	BDL	BDL	BDL	BDL	BDL
OCT	1.100 <T	.560 <T	5.800	.740 <T	.720 <T	.500 <T
DEC	BDL	BDL	.400 <T	BDL	BDL	BDL
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
JAN	.150 <T	.120 <T	.	.	.	.
FEB	1.400	.130 <T	16.000	.460 <T	1.800	.290 <T
APR	.580	.090 <T	3.400	.430 <T	2.500	.620
JUN	1.200	.120 <T	6.700	.310 <T	.	.
AUG	.620	.700	2.200	.260 <T	5.800	.750
OCT	.960	.140 <T	3.300	.280 <T	3.000	.640
DEC	.500 <T	.210 <T	3.800	.220 <T	3.400	.510
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
JAN	.250 <T	.370 <T	.	.	.	.
FEB	.260 <T	.340 <T	.410 <T	1.200	.500 <T	.410 <T
APR	.260 <T	.310 <T	.480 <T	.430 <T	.500 <T	.370 <T
JUN	.290 <T	.440 <T	.500 <T	.450 <T	.	.
AUG	.310 <T	.450 <T	.470 <T	.460 <T	.500 <T	.550
OCT	.260 <T	.440 <T	.530	.400 <T	.500 <T	.550
DEC	.320 <T	.450 <T	.550	.480 <T	.500 <T	.610
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
JAN	1.200 <T	BDL	.	.	.	.
FEB	2.000 <T	BDL	BDL	1.200 <T	1.600 <T	1.300 <T
APR	1.900 <T	2.000 <T	1.300 <T	1.300 <T	BDL	1.900 <T
JUN	1.300 <T	2.000 <T	2.500 <T	3.400 <T	.	.
AUG	BDL	2.500 <T	1.300 <T	2.100 <T	2.500 <T	1.800 <T
OCT	1.200 <T	1.800 <T	1.800 <T	2.100 <T	2.000 <T	1.300 <T
DEC	1.100 <T	BDL	1.200 <T	1.700 <T	1.300 <T	1.400 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
JAN	280.000	280.000				
FEB	150.000	140.000	150.000	150.000	150.000	160.000
APR	240.000	230.000	230.000	240.000	230.000	240.000
JUN	270.000	260.000	260.000	260.000		
AUG	220.000	210.000	200.000	200.000	200.000	210.000
OCT	270.000	260.000	260.000	250.000	260.000	250.000
DEC	280.000	260.000	260.000	250.000	240.000	240.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
JAN	15.000	9.900				
FEB	13.000	8.300	9.000	8.900	9.000	9.100
APR	13.000	9.600	10.000	8.900	8.300	8.600
JUN	21.000	17.000	16.000	17.000		
AUG	19.000	17.000	16.000	15.000	15.000	15.000
OCT	13.000	8.500	8.500	8.300	8.300	7.900
DEC	13.000	8.100	8.000	7.800	7.900	7.900
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
JAN	2.300	2.300				
FEB	1.300	.280 <T	.350 <T	.380 <T	.420 <T	.520
APR	2.400	1.200	.940	.830	.820	.890
JUN	2.000	.540	.810	.740		
AUG	1.400	.390 <T	.410 <T	.290 <T	.350 <T	.380 <T
OCT	3.000	1.000	2.100	2.200	1.900	2.000
DEC	3.000	2.900	2.300	2.200	2.200	2.300
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	.520	.450 <T				
FEB	2.200	1.500	1.100	1.100	.960	.960
APR	1.000	2.000	1.700	1.800	1.300	1.400
JUN	1.700	2.400	2.300	2.300		
AUG	1.700	1.100	1.100	.910	.790	.470 <T
OCT	2.000	2.600	2.400	2.400	1.600	1.600
DEC	.910	1.200	1.800	1.300	.860	.950
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
JAN	7.400	5.800				
FEB	16.000	7.100	150.000	34.000	54.000	6.300
APR	7.000	6.300	340.000	44.000	48.000	7.300
JUN	9.000	8.200	100.000	36.000		
AUG	6.700	9.500	150.000	52.000	56.000	6.400
OCT	7.100	7.700	170.000	45.000	25.000	3.000
DEC	19.000	19.000	120.000	27.000	57.000	5.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 1900 (D4)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	BDL
APR	ISM	ISM	.	BDL	.	BDL
JUN	BDL	BDL	.	BDL	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	2.000 <T	.	2.000 <T	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

		WATER TREATMENT PLANT			DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENANTHRENE (NG/L PAH)			DET'N LIMIT = 10.	GUIDELINE = N/A		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	INR	.	INR
OCT	10.000 <T	BDL	.	.	.	.
DEC	!!S	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
LINDANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 4000 (A1)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	BDL
APR	ISM	ISM	.	BDL	.	BDL
JUN	BDL	2.000 <T	.	2.000 <T	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	800.000	790.000	.	.	.	.
APR	310.000 <T	BDL	.	.	.	.
JUN	1780.000	1910.000	.	.	.	.
AUG	1270.000	1200.000	.	.	.	.
OCT	750.000	860.000	.	.	.	.
DEC	IIS	250.000 <T	.	.	.	.
CYANAZINE (BLADEX) (NG/L)			DET'N LIMIT = 100	GUIDELINE = 10000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	130.000 <T	210.000 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	IIS	BDL	.	.	.	.
DESETHYLATRAZINE (NG/L)			DET'N LIMIT = 200.0	GUIDELINE = 60000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	340.000 <T	330.000 <T	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	690.000 <T	620.000 <T	.	.	.	.
DEC	IIS	BDL	.	.	.	.
METOLACHLOR (NG/L)			DET'N LIMIT = 500.	GUIDELINE = 50000 (A2)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	.	.	.
APR	BDL	BDL	.	.	.	.
JUN	1500.000 <T	2100.000 <T	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	BDL	.	.	.	.
DEC	IIS	BDL	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L)	PHENOLICS		DET'N LIMIT = .200	GUIDELINE = 2 (A4)		
JAN	3.800	3.600	.	.	.	.
FEB	1.000	1.000	.	.	.	.
APR	1.200	.600 <T	.	.	.	.
JUN	BDL	BDL	.	.	.	.
AUG	BDL	BDL	.	.	.	.
OCT	BDL	.400 <T	.	.	.	.
DEC	2.000	1.600	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	.050 <T	.	IU	.	BDL
JUN	BDL	BDL	.	BDL	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)		
JAN	BDL	.050 <T	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	.150 <T	.	IU	.	.250 <T
JUN	BDL	.200 <T	.	.050 <T	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	.100 <T	.	IU	.	.050 <T
JUN	.150 <T	.100 <T	.	.150 <T	.	.
AUG	BDL	.100 <T	.	BDL	.	.100 <T
OCT	BDL	BDL	.	BDL	.	.050 <T
DEC	.050 <T	BDL	.	BDL	.	BDL
M-XYLENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	BDL	.	IU	.	.100 <T
JUN	BDL	.200 <T	.	.200 <T	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
O-XYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	.050 <T	.	IU	.	.100 <T
JUN	BDL	.050 <T	.	.100 <T	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
JAN	BDL	BDL	.	.	.	.
FEB	.150 <T	BDL	.	.100 <T	.	IU
APR	BDL	.050 <T	.	IU	.	BDL
JUN	.250 <T	.050 <T	.	.200 <T	.	.
AUG	BDL	.100 <T	.	.050 <T	.	.250 <T
OCT	BDL	BDL	.	BDL	.	.100 <T
DEC	.100 <T	BDL	.	BDL	.	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM DRESDEN WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	.200 <T	75.400	.	.	.	.
FEB	BDL	43.100	.	24.000	.	IU
APR	BDL	39.300	.	IU	.	31.400
JUN	BDL	37.100	.	34.000	.	.
AUG	BDL	45.100	.	40.700	.	41.100
OCT	BDL	68.900	.	63.900	.	53.500
DEC	BDL	35.300	.	35.100	.	31.300
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)		
JAN	.220	BDL	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	BDL	.	IU	.	BDL
JUN	BDL	BDL	.	BDL	.	.
AUG	BDL	BDL	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)		
JAN	BDL	24.400	.	.	.	.
FEB	BDL	8.550	.	6.350	.	IU
APR	BDL	14.550	.	IU	.	11.850
JUN	BDL	17.300	.	15.900	.	.
AUG	BDL	16.400	.	15.600	.	15.200
OCT	BDL	20.400	.	18.650	.	17.100
DEC	BDL	12.800	.	12.250	.	10.950
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)		
JAN	BDL	5.800	.	.	.	.
FEB	BDL	.800 <T	.	.900 <T	.	IU
APR	BDL	2.900	.	IU	.	2.500
JUN	BDL	4.600	.	4.800	.	.
AUG	BDL	3.800	.	3.900	.	4.000
OCT	BDL	3.800	.	3.000	.	3.300
DEC	BDL	2.100	.	2.100	.	2.000
BROMOFORM (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)		
JAN	BDL	.400 <T	.	.	.	.
FEB	BDL	BDL	.	BDL	.	IU
APR	BDL	BDL	.	IU	.	BDL
JUN	BDL	.200 <T	.	.400 <T	.	.
AUG	BDL	.200 <T	.	.200 <T	.	.200 <T
OCT	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)		
JAN	BDL	105.850	.	.	.	.
FEB	BDL	52.550	.	31.200	.	IU
APR	BDL	56.750	.	IU	.	45.750
JUN	BDL	59.250	.	55.100	.	.
AUG	BDL	65.550	.	60.400	.	60.500
OCT	BDL	93.150	.	85.600	.	73.850
DEC	BDL	50.200	.	49.350	.	44.250

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: P0C0D0 UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE

CAS#: 71-43-2

MOLECULAR FORMULAE: C_6H_6

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L

SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).

CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).

PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).

SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)

Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)

Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top

Steps:

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.